

# Claims

- [c1] A dielectric material comprising:  
a matrix of a material selected from the group consisting of organic materials, inorganic materials and organo-silicate materials;  
a plurality of pores dispersed throughout the matrix; and  
a gas filling the pores, said gas selected from the group consisting of inert gases, depositing gases, and breakdown suppressing gases.
- [c2] A dielectric material, according to claim 1, wherein the inert gases are selected from the group consisting essentially of  $N_2$ , He, Ne, Kr, Xe, and Ar.
- [c3] A dielectric material, according to claim 1, wherein the depositing gases are selected from the group consisting essentially of Silane, MethylSilane, DiMethylSilane, TriMethylSilane, TetraMethylSilane, TriEthoxySilane, MethylTriEthoxySilane, DiEthoxyMethylSilane, DiMethoxyMethylSilane, TetramethyCycloTetraSiloxane, OctymethyCycloTetraSiloxane, and DiMethylDiMethoxySilane.
- [c4] A dielectric material, according to claim 1, wherein the

breakdown suppressing gases comprises  $\text{SF}_6$ .

- [c5] A dielectric material, according to claim 1, wherein:  
the dielectric material has a porosity of 20–70%.
- [c6] A dielectric material, according to claim 1, wherein:  
the dielectric material has a porosity of 30–60%.
- [c7] A dielectric material, according to claim 1, wherein:  
the size of the pores is 0.1 – 10 nm.
- [c8] A dielectric material, according to claim 1, wherein:  
the size of the pores is 0.5 – 5 nm.
- [c9] A semiconductor substrate comprising a wiring layer, the  
wiring layer comprising:  
a dielectric material having filled pores; and  
trenches formed in the dielectric material and filled with  
metal.
- [c10] A semiconductor substrate, according to claim 9, further  
comprising:  
a dielectric layer disposed on the wiring layer.
- [c11] A plasma device comprising:  
an integrated circuit (IC) chip substrate;  
at least one dielectric layer on a surface of the substrate,  
the dielectric layer having a thickness;  
a cavity formed in the dielectric layer, the cavity having a

cross-dimension;  
at least two electrodes disposed in the cavity; and  
a plasma gas filling the cavity.

- [c12] A plasma device, according to claim 11, wherein:  
the cross-dimension of the cavity is 1.0 – 25,000 microns.
- [c13] A plasma device, according to claim 11, wherein:  
the electrodes are disposed on the bottom of the cavity.
- [c14] A plasma device, according to claim 11, further comprising:  
a capping layer disposed atop the cavity.
- [c15] A plasma device, according to claim 14, further comprising:  
a sheet of quartz disposed atop the capping layer.
- [c16] A plasma device, according to claim 11, wherein the at least two electrodes further comprises:  
at least two ignition electrodes disposed in the cavity;  
at least two switching electrodes disposed in the cavity.
- [c17] A plasma device, according to claim 16, wherein:  
the cavity has a length "L", a width "W", and a height "H";  
the length L is approximately 1–25 microns;  
the width W is approximately 1–25 microns; and

the height H is approximately 1–1000 microns.

- [c18] A plasma device, according to claim 16, wherein:  
the switching electrodes are disposed at opposite ends  
of the cavity; and  
the ignition electrodes are disposed on opposite sides of  
the cavity.
- [c19] A plasma device, according to claim 16, wherein:  
the switching electrodes are disposed at opposite sides  
of the cavity; and  
the ignition electrodes are disposed on opposite ends of  
the cavity.